



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

REC'D 14 APR 2005

Applicant's or agent's file reference DAW1337		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA416)	
International application No. PCT/US 03/8072	International filing date (day/month/year) 02.12.2003	Priority date (day/month/year) 18.12.2002	
International Patent Classification (IPC) or both national classification and IPC B05B7/24			
Applicant 3M INNOVATIVE PROPERTIES COMPANY et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 11 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 14.06.2004		Date of completion of this report 12.04.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Innecken, A Telephone No. +49 89 2399-8911 	

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US 03/38072

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1, 8, 9, 11-21	as originally filed
2, 5-7, 22	received on 23.12.2004 with letter of 20.12.2004
3, 4, 10	received on 11.03.2005 with letter of 11.03.2005

Claims, Numbers

1-13	received on 11.03.2005 with letter of 11.03.2005
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Drawings, Sheets

1/6-6/6	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/US 03/38072**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US 03/38072

Novelty, inventive step and industrial applicability (Item V)

1. Independent claims 1 and 10 meet the requirements of novelty, inventive step and industrial application according to Articles 33(2) to 33(4) PCT.
2. The subject-matter of independent claims 1 and 10 is novel as none of the prior art documents cited in the Search Report or acknowledged in the description discloses all of the features of these independent claims.
3. The documents cited in the Search Report do not render any suggestion to a skilled person to construct a filter for a liquid supply assembly as disclosed in **WO02/085533 (D4)** according to the further features of claim 1 or independent claim 10. The apparatus of (D4) differs from that of these claims by the body of the filter being sufficiently rigid to maintain an elongate tubular shape. This feature is per se known from (D2) or (D3). It does not seem to be obvious, however, to substitute the disposable "sock" filter of (D4) for a more expensive and bulky rigid filter. Thus, the subject-matter of claims 1 or 10 results from a step being non-obvious in view of the cited prior art documents in which no incentive is given to provide this specific structure and arrangement. Thus the filter or liquid supply assembly according to independent claims 1 or 10 involves an inventive step.
4. The subject-matter of independent claims 1 and 10 is able to work, and can be manufactured. Thus the subject-matter of claims 1 and 10 is looked upon as being industrially applicable.
5. Dependent claims 2 to 9, and 11 to 13 define further advantageous and nonobvious variations of the filter or liquid supply assembly according to independent claims 1 or 10 and thus equally meet the requirements of novelty, inventive step and industrial application according to Articles 33(2) to 33(4) PCT.

It is already known to provide a filter in the reservoir to remove contaminants as the liquid is withdrawn from the reservoir during operation of the spray gun. Typically, the reservoir has an outlet connected to an inlet on the spray gun and the filter is positioned across or within the outlet. The outlet is usually of comparatively small size compatible with the connection to the spray gun. The presence of solid particles in the liquid added to the reservoir can result in blockage of the filter so that flow of the liquid to the spray gun is restricted or, in extreme cases, prevented altogether.

10

A reduction in the flow of the liquid to the spray gun may have an adverse effect on the spray and the resulting paint finish may be unacceptable so that re-working is again required to obtain an acceptable paint finish. Moreover, opening of the reservoir is required to remove and replace the blocked filter with a new filter.

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This is time consuming and may require decanting of liquid remaining in the reservoir which is then returned to the reservoir when the new filter is in place. As a result, there is increased risk of spillage and possible introduction of contaminants into the liquid. Furthermore, some liquids require activation prior to spraying and have a relatively short life after activation. Delays caused by blockage of the filter may result in such liquids being unusable thereby adding further to costs.

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It is also known to filter the liquid to remove solid particles prior to or when adding the liquid to the reservoir by employing a filter externally of the reservoir.

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This avoids the need to provide a filter within the reservoir but is usually time consuming due to the capacity of the filter being less than the rate at which the liquid can be freely poured into the reservoir. In addition, there is an increased risk of spillage if the addition of the liquid exceeds the capacity of the filter causing the liquid to overflow. Also, dust or other airborne contaminants may be entrained in the filtered liquid with the resulting potential problems outlined above.

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Summary of Invention

The present invention is intended to provide an improved filter for liquid supply assemblies used to supply spray guns with resulting benefits and advantages for the user.

More specifically, at least one embodiment of the present invention provides a filter for a liquid supply assembly that allows liquid to be added to a reservoir in a simple manner so that contaminants in the liquid can be removed at the time of adding the liquid to the reservoir.

Additionally, at least one embodiment of the present invention provides a high flow filter for a liquid supply assembly that permits rapid filling of a reservoir with filtered liquid for supply to a spray gun.

Furthermore, at least one embodiment of the present invention provides a filter for a liquid supply assembly that can be left in place when a reservoir containing the filter is attached to a spray gun.

Moreover, at least one embodiment of the present invention provides a filter for a liquid supply assembly that permits a reservoir containing the filter to collapse as liquid is withdrawn from the reservoir.

Other benefits and advantages of the invention are referred to later herein.

According to a first aspect of the present invention, there is provided a filter for a liquid supply assembly including a reservoir for connection to spraying apparatus such as a spray gun, the filter comprising an elongate tubular body closed at one end and open at the other end, the open end being provided with a support collar for location in a filler opening of a reservoir so that the filter body extends away from the opening within the reservoir when liquid is added to the reservoir through the filler opening to filter the liquid added to the reservoir.

As used herein, the term "liquid" refers to all forms of flowable materials that can be applied to a surface using a spray gun (whether or not they are intended to colour the surface) including (without limitation) paints, primers, base coats, lacquers, varnishes and similar paint-like materials as well as other fluent materials which may be applied in atomised or non-atomised form depending on the properties and/or the intended application of the material and the term "liquid" is to be construed accordingly.

10 By this invention, the tubular body of the filter extends into the reservoir and can be arranged so that the surface area of the filter within the reservoir is optimised compared to the volume of the filter. As a result, the filter can have a high flow capacity that permits rapid filling of the reservoir with reduced risk of spillage. In this way, liquid can be filtered as it is poured into the reservoir to produce a supply of filtered liquid within the reservoir for supply to the spray gun when the reservoir is connected to the spray gun. Consequently, the filter does not interfere with flow of filtered liquid supplied to the spray gun and the risk of the spray gun being blocked or the surface finish being contaminated with solid particles in the liquid is reduced if not eliminated.

20 Preferably, the surface area to volume ratio of the tubular body is such that the liquid can be filtered at a rate compatible with the rate of addition of the liquid to provide rapid filling of the reservoir without spillage of the liquid. The surface area to volume ratio may vary depending on the properties of the liquid, for example viscosity, and the size of particles to be removed.

30 The tubular body of the filter may be comparatively rigid so as to maintain its shape. For example, the body of the filter may comprise a wire mesh. More preferably, however, the tubular body is flexible so that the filter can change shape. For example, the body of the filter may comprise a mesh of a plastics material such as polypropylene, polyester, polyamide (nylon) or any other suitable material. In this way, the filter may be supplied in a compact

configuration to reduce space for storage and transportation. Furthermore, where the reservoir is collapsible as liquid is withdrawn in use, the filter may be left in place within the reservoir and conform to the collapsed condition of the reservoir. The mesh can be woven, non-woven or knitted depending on the material, application and requirements such as mesh size and/or uniformity. The mesh may be formed by any suitable method, for example a plastics mesh may be formed by moulding or extrusion.

The filter may have an axial length chosen to provide a suitable flow capacity for the liquid to be filtered. For example, the filter may have an axial length substantially the same as the depth of the reservoir in which it is received. In this way, the available surface area of the filter within the reservoir can be maximised for a given size of filler opening. Moreover, if the reservoir is connected to the spray gun with the filter left in place within the reservoir, as the level of liquid falls in the reservoir, liquid contained in the filter can pass through the mesh body at the surface of the liquid. As a result, the flow of liquid to the spray gun is not reduced or interrupted as the liquid passes through the mesh body.

The support collar may be sized to fit the filler opening and preferably has an external lip at the outer end to locate and retain the collar in the opening. The lip may seat around the marginal edge of the filler opening at the outer end of the wall bounding the filler opening. Alternatively, the filler opening may have a counterbore at the outer end of the wall in which the lip is received to locate against an internal shoulder within the filler opening. In this way, the collar is prevented from passing completely through the filler opening.

The support collar may be made of plastics, such as polypropylene, polyamide (nylon) or polyethylene and is preferably integral with the mesh body of the filter. For example, the support collar may be moulded onto the outer end of the mesh body. In this way, the support collar locates the mesh body of the filter within the reservoir and conforms the open end to the shape of the filler opening. For

example, the support collar may be of circular, oval, square or other shape to match the shape of the filler opening.

5 The filter may be provided with means to assist in maintaining the tubular shape of the mesh body at least when liquid is added to the reservoir. In one arrangement, the filter may be provided with support hoops extending around the mesh body at axially spaced positions between the ends to maintain the tubular shape of the mesh body. The support hoops may be integral with the mesh body, for example the support hoops may be moulded with the mesh body. Preferably, 10 the support hoops allow the filter to conform to the shape of the reservoir, for example if the reservoir is constructed to collapse as liquid is withdrawn in use. In another arrangement, the support collar may be connected to a cage that surrounds the mesh body within the reservoir. The cage may comprise a plurality of legs extending from the collar at the open end of the mesh body to a base element at the closed end of the mesh body. The legs are preferably uniformly 15 spaced apart and may be flexible to allow the filter to conform to the shape of the reservoir, for example if the reservoir is constructed to collapse as liquid is withdrawn in use. Alternatively, the cage may be comparatively rigid to maintain the shape of the filter both when liquid is added to the reservoir and when liquid is withdrawn from the reservoir in use, for example if the reservoir does not 20 collapse as liquid is withdrawn in use. The cage may be integral with the mesh body, for example, the cage may be moulded with the mesh body.

According to a second aspect of the present invention, there is provided a liquid 25 supply assembly for use with spraying apparatus such as a spray gun, the liquid supply assembly comprising a reservoir for containing a liquid, the reservoir being connectable in use to a spray gun for supply of the liquid to an inlet of the spray gun and having a filler opening for adding liquid to the reservoir, and a filter for filtering liquid added to the reservoir through the filler opening, the 30 filter comprising an elongate tubular body closed at one end and open at the other end, the open end being provided with a support collar for location in the filler opening so that the filter body extends away from the opening within the reservoir

when liquid is added to the reservoir through the filler opening to filter liquid added to the reservoir.

Preferably, the filler opening is provided in an end wall of the reservoir. In one
5 arrangement, the reservoir comprises an open-topped container and a lid arranged to close the open end of the container and forming the end wall in which the filler opening is formed.

Advantageously, the lid is provided with an outlet connectable to the spray gun.
10 In one arrangement, the outlet comprises a supply opening formed in the lid separately from the filler opening and leading to a tubular spout connectable to the spray gun. In this way, the filter may be left in position within the reservoir when the reservoir is connected to the spray gun.

15 The filler opening may be provided with a releasable closure such as a screw cap that can be removed when it is desired to add liquid to the reservoir and re-attached to close the filler opening when the reservoir is connected to the spray gun. With this arrangement, access to the filler opening may be provided to add liquid to the reservoir when the reservoir is connected to the spray gun.

20 Preferably, the filler opening is larger than the supply opening and both openings are offset from the central longitudinal axis of the reservoir. In this way, access to the filler opening may be improved when the reservoir is connected to the spray gun to allow liquid to be added to the reservoir without disconnecting the
25 reservoir from the spray gun.

In another arrangement, the filler opening is located centrally of the lid and the outlet is provided by a separate connector releasably secured to the lid around the filler opening and having a tubular spout connectable to the spray gun. In this
30 way, the reservoir can be detached from the connector to provide access to the filler opening when it is desired to add liquid to the reservoir. With this

Pre-filling may be employed for liquids that can be packaged and stored until required without degrading. Thus, pre-filling may be useful for liquids that can be supplied ready for use (i.e. without requiring modification to match the colour to an existing colour). For example, base coats in standard colours of a specified shade and/or primers or lacquers that can be supplied in a non-activated form and activated (if necessary) by suitable means such as by exposure to a source of energy, e.g. ultraviolet radiation, visible light or electrical energy at the time of use.

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According to third aspect of the present invention, there is provided spraying apparatus comprising a spray gun and a liquid supply assembly according to the second aspect of the invention.

15 The spray gun may be of the gravity feed, suction feed or pressure feed type.

Brief Description of the Drawings

Embodiments of the invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:-

20

Figure 1 is a perspective view of a spray gun for use with a liquid supply assembly according to the present invention;

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Figure 2 is an end view of the spray gun adaptor shown in Figure 1;

Figure 3 is a perspective view of a liquid supply assembly for use with the spray gun of Figures 1 and 2 and incorporating a filter according to a first embodiment of the present invention;

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Figure 4 is a perspective view of the filter shown in Figure 3;

Furthermore, by providing a filler opening separate from the supply opening, the filter can be left in place when the reservoir is attached to the spray gun so as to be available if it is desired to top-up the reservoir with more liquid.

- 5 Additionally, by providing the filter with a flexible mesh body, the filter can be employed both in reservoirs that are collapsible as liquid is withdrawn and in reservoirs that are rigid.

- 10 It will also be appreciated that the exemplary embodiments described herein are intended to illustrate the diverse range and application of the invention and that features of the embodiments may be employed separately or in combination with any other features of the same or different embodiments.

- 15 Moreover, while the exemplary embodiments described and illustrated are believed to represent the best means currently known to the applicant, it will be understood that the invention is not limited thereto and that various modifications and improvements can be made within the spirit and scope of the invention as generally described herein.

20

CLAIMS

1. A filter for a liquid supply assembly including a reservoir for connection to spraying apparatus such as a spray gun, the filter comprising an elongate tubular
5 body closed at one end and open at the other end, the open end being provided with a support collar that fits in a filler opening of a reservoir and locates said open end so that the filter body extends away from the opening within the reservoir when liquid is added to the reservoir through the filler opening to filter the liquid added to the reservoir.
- 10 2. The filter of claim 1 wherein the tubular body of the filter is sufficiently rigid to maintain an elongate tubular shape.
3. The filter of claim 1 wherein the tubular body of the filter has a cross-
15 section such that the filter can be dropped into the reservoir to locate the support collar in the filler opening.
4. The filter of claim 3 wherein the tubular body of the filter has an axial
20 length substantially the same as the depth of the reservoir in which it is received.
5. The filter of claim 1 wherein the support collar has an external lip at the outer end that seats around the marginal edge of the filler opening to locate and retain the collar in the opening.
- 25 6. A filter of claim 1 wherein the support collar is integral with the tubular body of the filter.
7. The filter of claim 1 wherein the support collar is connected to a cage that surrounds the tubular body of the filter within the reservoir.
- 30

8. The filter of claim 7 wherein the cage comprises a plurality of legs extending from the support collar at the open end of the tubular body to a base member at the closed end of the tubular body.

5 9. The filter of claim 1 wherein the tubular body is provided with at least one annular support hoop spaced from the collar.

10. A liquid supply assembly for use with spraying apparatus such as a spray gun, the liquid supply assembly comprising a reservoir for containing a liquid, the
10 reservoir being connectable in use to a spray gun for supply of the liquid to an inlet of the spray gun and having a filler opening for adding liquid to the reservoir, and a filter for filtering liquid added to the reservoir through the filler opening, the filter comprising an elongate tubular body closed at one end and open at the other end, the open end being provided with a support collar that fits
15 in the filler opening so that the filter body extends away from the opening within the reservoir when liquid is added to the reservoir through the filler opening to filter liquid added to the reservoir.

11. The liquid supply assembly of claim 10 wherein, the filler opening is
20 provided in an end wall of the reservoir.

12. The liquid supply assembly according to claim 11 wherein, the reservoir comprises an open-topped container and a lid arranged to close the open end of the container and forming the end wall in which the filler opening is formed.
25

13. A liquid supply assembly according to claim 12 wherein, the lid is provided with an outlet connectable to the spray gun, which outlet comprises a supply opening formed in the lid separately from the filler opening and leading to a tubular spout connectable to the spray gun.
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14. The liquid supply assembly of claim 13 wherein both the filler and supply openings are offset from the central longitudinal axis of the reservoir.

15. The liquid supply assembly of claim 12 wherein the lid and container are permanently secured together around the marginal edge of the open end of the container.

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16. The liquid supply assembly of claim 12 wherein the container is collapsible as liquid is withdrawn from the reservoir in use.

17. A liquid supply assembly of claim 16 wherein the container has a flexible
10 sidewall and a comparatively rigid base and the sidewall is foldable to move the base towards the lid as liquid is withdrawn from the reservoir.

18. The liquid supply assembly of claim 17 wherein the lid is provided with an extension sleeve or cage surrounding the container to provide support for the
15 container

19. The liquid supply assembly of claim 17 wherein the container is received in an outer container to which the reservoir is secured by a collar releasably attached to the outer container over the lid.

20

20. A spraying apparatus comprising a spray gun and a liquid supply assembly of claim 10 wherein the reservoir and spray gun are provided with cooperating bayonet type formations for releasably securing to the reservoir to the spray gun.

21. A spraying apparatus comprising a spray gun and a liquid supply assembly
25 of claim 11 having an outlet comprising an opening in the end wall of the reservoir separate from the filler opening and leading to a tubular spout connectable to the spray gun wherein the spray gun has a socket to receive the spout and the socket is detachable from the spray gun.

30

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/38072

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B05B7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/085533 A (DOUGLAS MALCOLM F ;ADAMS MIKE J R (GB); JOSEPH STEPHEN C P (GB); B) 31 October 2002 (2002-10-31) page 27, line 17 - line 22; figure 21 ---	1,10-16, 20,21
X	WO 98/32539 A (DOUGLAS MALCOLM F ;BUTLER ALAN F (GB); BASTOW DAVID R (GB); JOSEPH) 30 July 1998 (1998-07-30) page 14, line 4 - line 16; figure 12 -----	1,3-5, 10,11

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

14 May 2004

Date of mailing of the international search report

24/05/2004

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/38072

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 02085533	A	31-10-2002	CA 2445183 A1 EP 1385632 A1 WO 02085533 A1	31-10-2002 04-02-2004 31-10-2002
WO 9832539	A	30-07-1998	CA 2277096 A1 CN 1142830 C DE 29825015 U1 EP 1415719 A1 EP 0954381 A1 JP 2001508698 T PL 334754 A1 WO 9832539 A1	30-07-1998 24-03-2004 11-03-2004 06-05-2004 10-11-1999 03-07-2001 13-03-2000 30-07-1998